

In the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (original) An apparatus for delivery of x-ray irradiation to a target, comprising:
a waveguide for transporting x-ray irradiation, the waveguide comprising a first end and second end;
a means for coupling x-ray irradiation into the first end of the waveguide, wherein the means for coupling x-ray irradiation into the first end of the waveguide comprises a first tapered cylinder;
and
a means for directing the x-ray irradiation exiting the second end of the waveguide to a target.
2. (original) The apparatus according to claim 1, wherein the waveguide is a hollow waveguide.
3. (original) The apparatus according to claim 1, wherein the first tapered cylinder is a hollow tapered cylinder.
4. (currently amended) The apparatus according to claim 3, wherein the first tapered cylinder reduces the cross-sectional area of the x-ray irradiation entering the first tapered cylinder as the x-ray ~~radiation~~ irradiation traverses the first tapered cylinder and is coupled into the first end of the waveguide.
5. (original) The apparatus according to claim 3, wherein the means for directing the x-ray irradiation exiting the second end of the waveguide to a target comprises a reflecting tip such that the x-ray irradiation exiting the second end of the waveguide is incident on the reflecting tip and is reflected by the reflecting tip to the target.
6. (original) The apparatus according to claim 5, wherein the reflecting tip comprises a first portion of glass surrounded by a second portion of glass having a different index of refraction than the first portion of glass such that an outer surface of the reflecting tip is cylindrical, wherein x-ray

irradiation exiting the second end of the waveguide and incident on the reflecting tip is reflected at a boundary between the first portion of glass and the second portion of glass.

7. (original) The apparatus according to claim 6, wherein the target has a generally cylindrical shape and is generally concentric with the outer surface of the reflecting tip, wherein the reflecting tip reflects the x-ray irradiation in an approximately cylindrical pattern.

8. (original) The apparatus according to claim 1, further comprising:
a means for generating x-ray irradiation.

9. (original) The apparatus according to claim 8, wherein the means for generating x-ray irradiation comprises a means for generating short pulses of optical energy and a means for using the short pulses of optical energy to generate x-rays from a plasma.

10. (original) The apparatus according to claim 2, wherein the hollow waveguide comprises a reflective layer on an inner surface of the hollow waveguide.

11. (original) The apparatus according to claim 10, wherein the reflective layer is a super mirror.

12. (original) The apparatus according to claim 3, wherein the hollow tapered cylinder is a hollow linear tapered cylinder.

13. (original) The apparatus according to claim 10, wherein the hollow waveguide propagates an approximately homogenous approximately Gaussian x-ray beam.

14. (original) The apparatus according to claim 7, wherein the reflecting tip comprises a glass outer wall through which the x-ray irradiation passes after being reflected by the reflecting tip.

15. (original) The apparatus according to claim 7, wherein the boundary between the first portion of glass the second portion of glass is conically symmetric about a central axis of the waveguide.

16. (original) The apparatus according to claim 5, further comprising:
a means for receiving x-ray irradiation exiting the second end of the waveguide and outputting the x-ray irradiation such that the outputted x-ray irradiation is incident on the reflecting tip.

17. (original) The apparatus according to claim 16, wherein the means for receiving x-ray irradiation exiting the second end of the waveguide and outputting the x-ray irradiation such that the outputted x-ray irradiation is incident on the reflecting tip is a second tapered cylinder.

18. (original) The apparatus according to claim 17, wherein the second tapered cylinder is a hollow tapered cylinder.

19. (original) The apparatus according to claim 18, wherein the cross-sectional area of the x-ray irradiation beam outputted from the second hollow tapered cylinder is smaller than the x-ray irradiation beam received by the second hollow tapered cylinder.

20. (original) The apparatus according to claim 18, wherein the x-ray irradiation beam exiting the second hollow tapered cylinder is an approximately homogeneous approximately Gaussian x-ray irradiation beam.

21. (original) A method of selectively delivering x-ray irradiation to a specific location on an internal surface of a human or animal body, comprising:

selecting a specific location on an internal surface of a human or animal body to which delivery of x-ray irradiation is desired;

generating x-ray irradiation external to the human or animal body;

transporting via a waveguide the x-ray irradiation inside the human or animal body; and

delivering the x-ray irradiation to the specific location.

22. (original) The method according to claim 21, wherein the specific location is a portion of an inner arterial wall of an artery.

23. (original) The method according to claim 22, wherein the inner arterial wall of the artery is irradiated after balloon angioplasty is performed on the artery.

24. (original) The method according to claim 21, wherein the specific location is a tumor, and wherein sufficient x-ray irradiation is delivered to the tumor such that at least a portion of the tumor is necrotized.

25. (original) The method according to claim 21, wherein generating x-ray irradiation comprises generating short pulses of optical energy and using the short pulses of optical energy to generate x-rays from a plasma.

26. (original) The method according to claim 21, wherein transporting via a waveguide the x-ray irradiation inside the human or animal body comprises transporting via a hollow waveguide the x-ray irradiation inside the human or animal body.

27. (original) The method according to claim 26, wherein the hollow waveguide has a reflective coating on an inner surface of the hollow waveguide.

28. (original) The method according to claim 27, wherein the reflective coating on the inner surface of the hollow waveguide is a super mirror.

29. (original) The method according to claim 26, wherein the x-ray irradiation generated external to the body is coupled into the waveguide via a tapered cylinder.

30. (original) The method according to claim 29, wherein the tapered cylinder is a hollow tapered cylinder.

31. (original) The method according to claim 22, wherein a distal end of the waveguide is inserted into the artery to be irradiated and guided within the artery until the distal end reaches the specific location.

32. (original) The method according to claim 31, wherein the waveguide propagates an approximately homogeneous approximately Gaussian x-ray beam.

33. (original) The method according to claim 31, wherein delivering the x-ray irradiation to the specific location comprises reflecting the x-ray irradiation exiting the distal end of the waveguide toward the specific location via a reflective tip.

34. (original) The method according to claim 33, wherein the reflective tip comprises a glass outer wall through which the x-ray irradiation passes after being reflected by a reflective portion of the reflective tip.

35. (original) The method according to claim 33, wherein the reflective tip is conically symmetric about a central axis of the waveguide.

36. (original) The method according to claim 35, wherein an approximately cylindrical pattern of x-ray irradiation on the inner arterial wall is produced.

37. (original) The method according to claim 31, wherein an x-ray irradiation beam exiting the distal end of the waveguide is coupled into a second tapered cylinder, wherein the x-ray irradiation beam exiting the second tapered cylinder has a smaller cross-sectional area than the x-ray irradiation coupled into the second tapered cylinder.